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It is claimed that terfenadine does not have the central nervous system side effects (namely, sedation and disturbed coordination) that are associated with other antihistamines such as diphenhydramine. The purpose of this study was to evaluate the separate effects of standard dosages of antihistamines (terfenadine (60mg) and diphenhydramine (50mg)) on the speed of detection of visually presented targets and rifle marksmanship. Using a double-blind Latin square design, 12 trained subjects were exposed to four separate test conditions over four separate test days: (a) control, (b) placebo, (c) 60 mg terfenadine, and (d) 50mg diphenhydramine. Each test session was three hours in duration, during which time the subject monitored the target scene of the Weaponeer M16A1 Rifle Marksmanship Simulator. When a target appeared, the subject pressed a key, lifted the rifle, aimed, and fired at the target. Speed of target detection was measured in terms of the time required by the subject to press the key. Marksmanship was measured in terms of number of hits.

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19. ABSTRACT (continued)

As compared to placebo and control conditions, 50mg diphenhydramine significantly degraded both target detection time and marksmanship; 60 mg terfenadine had no effect on either of the dependent variables. Regardless of drug condition, target detection time increased as time on the task increased. Keywords:

See Pg. A

Antihistamines and Sentry Duty: Effects of Terfenadine and Diphenhydramine on Target Detection and Rifle Marksmanship

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ABSTRACT

It is claimed that terfenadine does not have the central nervous system side effects (namely, sedation and disturbed coordination) that are associated with other antihistamines such as diphenhydramine. The purpose of this study was to evaluate the separate effects of standard dosages of antihistamines (terfenadine (60mg) and diphenhydramine (50mg)) on the speed of detection of visually presented targets and rifle marksmanship. Using a double-blind Latin square design, 12 trained subjects were exposed to four separate test conditions over four separate test days: (a) control, (b) placebo (c) 60mg terfenadine, and (d) 50mg diphenhydramine. Each test session was three hours in duration, during which time the subject monitored the target scene of the Weaponeer M16A1 Rifle Marksmanship Simulator. When a target appeared, the subject pressed a key, lifted the rifle, aimed, and fired at the target. Speed of target detection was measured in terms of the time required by the subject to press the key. Marksmanship was measured in terms of number of hits. As compared to placebo and control conditions, 50mg diphenhydramine significantly degraded both target detection time and marksmanship; 60mg terfenadine had no effect on either of the dependent variables. Regardless of drug condition, target detection time increased as time on the task increased.

Introduction

Antihistamines are commonly used to alleviate symptoms associated with common allergies such as seasonal rhinitis, conjunctivitis, and urticaria. At least 10% of the population suffers from hay fever (Harland & McBride, 1974). The most frequent side effect of many antihistamines (for example, diphenhydramine) is sedation with related central nervous system side effects such as sleepiness, dizziness, and disturbed coordination. The use of antihistamines by soldiers could have a serious negative impact on military performance such as rifle marksmanship and sentry duty. It is claimed that a relatively new antihistamine, called terfenadine, does not have the central nervous system side effects that are associated with other antihistamines such as diphenhydramine. Nevertheless, there is little information on the effects of any of the antihistamines on rifle marksmanship or sentry duty.

The US Army has recently introduced a rifle simulator into its basic rifle marksmanship training program. This simulator, called the Weaponeer (Spartanics, Inc.), utilizes a modified M16A1 rifle and incorporates realistic recoil and realistic auditory feedback. Soldier performance on the Weaponeer has been shown to be predictive of actual live fire performance on the rifle range (Schendel, Heller, Finley, and Hawley, 1985). With the development of the Weaponeer, it is now possible to conduct empirical investigations of marksmanship under controlled laboratory conditions (Johnson and Kobrick, 1988; Kobrick, Johnson, and McMenemy, 1988).

The purpose of this study was to evaluate the separate effects of standard dosages of antihistamines (terfenadine (60mg) and diphenhydramine (50mg)) on the speed of detection of visually presented targets and rifle marksmanship during 3 hours of simulated sentry duty.

Method

Twelve male soldier volunteers, ages 18-42, were recruited from the military test subject population at the US Army Natick Research, Development and Engineering Center (Natick, MA). They were screened to eliminate anyone with medical conditions which might be aggravated by the administration of diphenhydramine or terfenadine. They were also tested for normal correctable vision (20/20 Snellen); only those prospective test subjects with acceptable vision were allowed to participate. Individuals with allergic rhinitis or colds were not allowed to participate. During all training and test sessions, subjects were dressed in the standard US Army battle dress uniform (including helmet, web belt, and full canteen).

Prior to testing, subjects were given rifle marksmanship training on the Weaponeer M16A1 Rifle Marksmanship Simulator and were familiarized with the targets to be presented during testing (full body E-type silhouettes at a simulated distance of 250 meters). Using a double-blind Latin square design, subjects were then exposed to four separate test conditions over four separate test days: (a) control, (b) placebo (c) 60mg terfenadine, and

(d) 50mg diphenhydramine. The test days were separated by days off to eliminate possible confounding due to residual drug effects.

Testing was conducted in the morning between 0800 and 1200 hours. Subjects were not permitted to consume alcohol during the 24 hours prior to a test day, and were instructed to be in bed by 2200 hours the night before a test day. The test session lasted three hours, during which time the subject assumed a standing foxhole position and monitored the target scene of the Weaponeer. He was told to monitor the target scene and to fire at a target when it appeared. The Weaponeer M16A1 modified rifle lay next to the subject at chest height. When a pop-up target appeared, the subject pressed a telegraph key, lifted the rifle, aimed, and fired at the target. The number of stimulus (target) presentations per 30 minute period was 12, with interstimulus intervals of .75, .75, 1, 1, 1, 1.5, 2, 2, 2, 3, 5, and 10 minutes. These interstimulus intervals are the same as those used by Mackworth (1950) and were randomized for each 30 minute period. Each target was set to appear for 6 seconds. The Weaponeer was set in the "kill" mode, providing the subject with immediate feedback as to whether or not he hit the target; that is, if he hit the target, it would fall; if he missed the target, it would remain in view for the full six seconds before falling. Target detection time was measured in terms of the time required by the subject to press the telegraph key in response to the presentation of the target. This time interval was measured by a Gerbrands Model G1280 electronic stop clock started through a relay in common with the target presentation switch of the Weaponeer control console. Pressing of the telegraph key de-activated the stop clock. Marksmanship was measured in terms of number of targets hit. Target detection time and rifle marksmanship were averaged every 30 minutes.

Target detection time and marksmanship were each analyzed by means of a 4 x 6 (drug x time period) repeated measures analysis of variance.

Results

Target detection time. A significant main effect due to drug was found for target detection time ($F(3,33) = 4.58$, ($p<.01$). Multiple comparisons showed that target detection time was significantly ($p<.001$) impaired by 50mg diphenhydramine (mean = 1555 milliseconds) while terfenadine, placebo, and control treatments (means = 1251, 1306, and 1142 milliseconds respectively) did not significantly differ from one another on this measure. A significant main effect due to time on sentry duty (time period) was found for target detection time ($F(5,55) = 5.97$, ($p<.001$). Multiple comparisons showed that target detection time deteriorated with time on sentry duty such that impairments were evident by the second 30 minute period (mean detection time for first 30 minute period = 1107 milliseconds; mean detection time for second 30 minute period = 1261 milliseconds; $p>.01$). This relatively rapid deterioration in vigilance performance is consistent with that found by Mackworth (1950). Impairments persisted for the remainder of the 3-hour session (mean detection times = 1318, 1342, 1362, and 1488 milliseconds for each of the remaining 30 minute periods). For target detection time, there was no significant drug x time period interaction.

Marksmanship. A significant main effect due to drug was found for marksmanship ($F(3,33) = 3.62$, ($p<.05$). Multiple comparisons showed that marksmanship was significantly ($p<.05$) impaired by 50mg diphenhydramine (mean number of hits per period = 8.5) while terfenadine, placebo, and control treatments (means = 9.6, 9.5, and 9.8 respectively) did not significantly differ from one another on this measure. For marksmanship, there was no significant main effect of time on sentry duty; neither was there a significant drug x time period interaction.

Conclusion

Compared to the placebo and control conditions, 50mg diphenhydramine significantly degraded both target detection time and marksmanship; 60 mg terfenadine had no effect on any of the dependent variables. Regardless of drug condition, target detection time increased as time on the task increased.

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